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DISHWASHER
[SHOKKI SENJOKI]

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Specification

1. Title of the Invention

Dishwasher

2. Scope of Patent Claims

1. A dishwasher, characterized by the fact that in a dishwasher that sequentially carries out each process of washing dishware housed in a dishware cage and drying utilizing a heating heater, it is equipped with heat responding members made of a shape memory material that are installed in the above mentioned dishware cage, support the above mentioned dishware, detect the temperature in the above mentioned [sic] washing tank, and change the housing state of the dishware.

3. Detailed Description of the Invention

(Industrial Application Field)

The present invention pertains to a dishwasher that sequentially carries out each process of washing dishware

¹ Numbers in the margin indicate pagination in the foreign text.

housed in a dishware cage and drying utilizing a heating heater.

(Prior Art)

In a general dishwasher, dishware is washed by spraying water (or hot water) on the dishware housed in a dishware cage from its lower side. Therefore, when the dishware is arranged in the dishware cage, it is desirable to bring the above mentioned spraying water into contact with fouled surfaces of the dishware in terms of increasing the washing performance. For this reason, a support member for supporting the dishware housed in the dishware cage in an inclined state has been installed.

(Problems to be Solved by the Invention)

However, in the case that dishware is housed in an inclined state in a dishware cage, like in the above mentioned conventional constitution, water remains at the rims of the bottoms of the dishware after washing the dishware. For this reason, a long time was required in order to dry the above mentioned remaining water, which deteriorated the drying performance.

Accordingly, the purpose of the present invention is to provide a dishwasher that can simultaneously improve the washing performance in the dishware washing stage and

improve the drying performance in the drying stage after the washing.

(Constitution of the Invention)

(Means to Solve the Problems)

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The present invention is a dishwasher characterized by the fact that in a dishwasher that sequentially carries out each process of washing dishware housed in a dishware cage and drying utilizing a heating heater, it is equipped with heat responding members made of a shape memory material that are installed in the above mentioned dishware cage, support the above mentioned dishware, detect the temperature in the above mentioned [sic] washing tank, and change the housing state of the dishware.

(Operation)

If the process of drying dishware using the heating heater is started and the temperature in the washing tank is raised, the heat responding members made of a shape memory material, which have detected the temperature, change the housing state of the dishware in the dishware cage. Water remaining at the rims of the bottoms of the dishware is dropped by this change in the housing state and the vibration at that time, and the amount of water

attached to the dishware is reduced, shortening the drying time of the dishware.


(Application Example)

Next, an application example of the present invention will be explained in detail referring to the figures.

First, in Figure 4, 1 is an external box, and a washing tank 2 is arranged in the box. The bottom of the washing tank 2 is a reservoir part 2a for reserving water for detergent washing and rinsing. 3 is a door for opening and closing a front opening part of the washing tank 2, and 4 and 4 are spray arms, for example, two pieces, arranged in the lower part of the washing tank 2. 5 is a pump arranged in the reservoir part 2a and is rotated and driven forward and backward via a belt transmission mechanism 7 by a driving motor 6. When the pump is rotated forward, water in the reservoir part 2a is absorbed by rotating a blade 8 and given as pressure water to the spray arms 4 and 4 via pipes 9 and 9, and when the pump is rotated backward, water in the reservoir part 2a is absorbed by rotating a blade 10 and discharged to the outside via a drainage pipe 11. 12 is an upper dishware cage, which will be mentioned later, and 13 is a lower dishware cage. These dishware cages are arranged so that they can be put in and out of the washing tank 2 and are positioned above the spray arms 4 and 4.

Water from the spray arms 4 and 4 is thus sprayed on the dishware (not shown in the figure) housed in these dishware cages 12 and 13. 14 is a water supply pipe installed at the outside of the washing tank 2, is connected to a water supply source not shown in the figure, and makes its tip opening part 14a face the inside of the washing tank 2. In addition, a water supply valve 15 is installed at a halfway part of the water supply pipe 14. 16 is a sheathed heater, for example, as a heating heater arranged at the inner bottom of the washing tank 2, and it heats water in the reservoir part 2a, carries out washing with warm water and rinsing with warm water, and dries the above mentioned dishware after finishing the washing and rinsing. Moreover, 17 is an air suction pipe installed at the outer bottom of the washing tank 2, its tip opening part 17a faces the inside of the reservoir part 2a, and it introduces air during the drying operation of the above mentioned sheathed heater 16.

On the other hand, the above mentioned upper dishware cage 12 will be mentioned in detail referring to Figures 1 through 3. The upper dishware cage 12 is constituted by combining wire rods in a grid shape as a whole, and multiple standing support parts 18 as heat responding members are vertically installed at its bottom. The

standing support part 18, for example, has an approximate  shape and consists of a bottom side part 18a fixed to the bottom of the upper dishware cage 12, heat responding parts 18b made of a shape memory material such as shape memory alloy respectively installed at both ends of the bottom side part 18a, and extended parts 18c extended upward from the heat responding parts. In addition, the standing support parts 18, as shown in Figure 1, always exhibit an obliquely upward inclined state and exhibit a state directed in an approximately vertical direction (shown by an alternate long and two short dashes line in Figure 1) in accordance with the deformation of the heat responding parts 18b made of a shape memory alloy when the drying stroke of the dishware is advanced and the temperature in the washing tank 2, which is generated by the sheathed heater 16, exceeds a prescribed temperature.

Next, the operation of the above mentioned constitution will be explained. First, dishware is supported by the standing support parts 18 (see the solid line in Figure 1) of the upper dishware cage 12, and the dishware in an inclined housing state is housed in the upper dishware cage 12. The upper dishware cage 12 is arranged in the washing tank 2, and a detergent required for the washing of one cycle is put into the washing tank

2. If a start switch not shown in the figure is operated, the water supply valve 15 is then opened to supply a prescribed amount of water to the reservoir part 2a of the washing tank 2. Next, the driving motor 6 is electrified to rotate and drive the pump 5, and the water in the reservoir part

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2a is sprayed on the above mentioned dishware from the spray arms 4 and 4 by the rotation of the blade 8, starting the detergent washing operation. At that time, since the dishware is in an inclined state by the standing support parts 18, a detergent solution in which the water and the detergent are mixed in the washing tank 2 is contacted with good efficiency to the fouled surfaces of the dishware, so that stains such as oil attached to the dishware are effectively washed off.


When the above detergent washing operation is finished, the driving motor 6 is electrified in the opposite direction to rotate and drive the pump 5 backward, and the water, that is, the fouled detergent solution in the reservoir part 2a, is absorbed by the rotation of the blade 10 and discharged via the drainage pipe 11. Next, a rinsing operation is advanced. In this rinsing operation, an operation similar to the above mentioned detergent

washing operation is carried out without using a detergent. First, the water supply valve 15 is opened to supply a prescribed amount of water into the washing tank 2, and the pump 5 is driven to spray the water in the washing tank 2 from the spray arms 4 and 4, implementing a rinsing operation with clean water. At that time, since the dishware is also in an inclined state by the standing support parts 18, the above mentioned spraying water is contacted with good efficiency to the dishware.

After this rinsing operation, draining is carried out by the pump 5, and the dishware washing stage is finished. Next, the dishware drying stage, that is, a drying operation using the sheathed heater 16, is carried out for an appropriate time. In this case, if the temperature in washing tank 2 raised by the heating of the sheathed heater 16 exceeds a prescribed temperature, the heat responding parts 18b made of a shape memory alloy in the standing support parts 18 of the upper dishware cage 12 detect the above mentioned temperature and are deformed in a directed state in the vertical direction shown by the alternate long and two short dashes line in Figure 1. As a result, since the housing state of the dishware in the upper dishware cage 12 is changed and the water remaining at the rims of the bottoms of the dishware is dropped, the amount of water

that is attached to the dishware is reduced, thus shortening the drying time of the dishware. In addition, in the change of the housing state of the dishware, since this change is enacted relatively rapidly and the dishware is vibrated, the above mentioned water drop is reliably carried out.

As mentioned above, according to this application example, since its constitution is automatically changed so that the dishware housed in the dishware cage 12 exhibits an inclined state in the washing stage and the above mentioned dishware exhibits a vertical state in the drying stage, the washing performance in the washing stage can be improved, and the drying time in the drying process can be shortened, as compared to the prior art, improving the drying performance. In addition, since the standing support parts 18 consist of the bottom side parts 18a, heat responding parts 18b made of a shape memory alloy, and extended parts 18c, a sensor for detecting the temperature in the washing tank 2 and an operation mechanism for deforming the housing state of the dishware can be realized by a simple structure.

Moreover, in the above mentioned application example, the standing support parts 18 have been constituted in an approximate  shape; however, without being limited to the

shape, any structure that can support dishware may be adopted, and various deformations are possible.

Furthermore, the standing support parts 18 have been installed only in the upper dishware cage 12; however, they may also be installed in the lower dishware cage 13. In addition, as the shape memory material, a so-called shape memory polymer may also be used instead of the shape memory alloy.

(Effects of the Invention)

As is seen from the above explanation, according to the present invention, since the heat responding members made of a shape memory material, which support dishware, detect the temperature in the washing tank, and change the housing state of the dishware, are installed in the dishware cage, the improvement of the washing performance in the washing stage of the dishware and the improvement of the drying performance in the drying stage after the washing can be simultaneously realized, exerting an excellent effect.

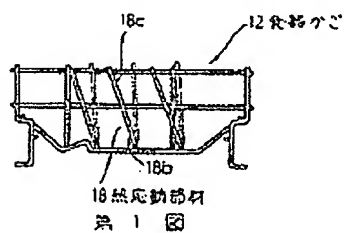
4. Brief Description of the Figures

The figures show an application example of the present invention. Figure 1 is a side view showing an upper dishware cage, Figure 2 is a plan view showing the upper

dishware cage, Figure 3 is a front view showing the upper dishware cage, and Figure 4 is an entire vertical cross section.

In the figures, 2 is a washing tank, 12 is an upper dishware cage (dishware cage), 16 is a sheathed heater (heating heater), and 18 is a standing support part (heat responding member).

Figure 1:



12 Dishware cage

18 Standing support part

Figure 2:

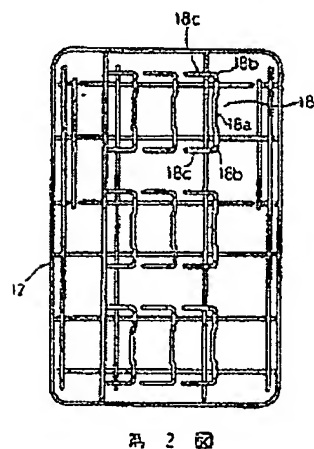
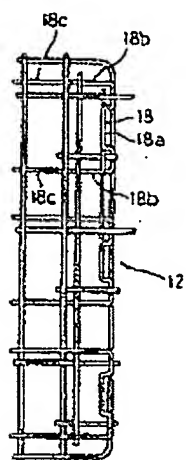
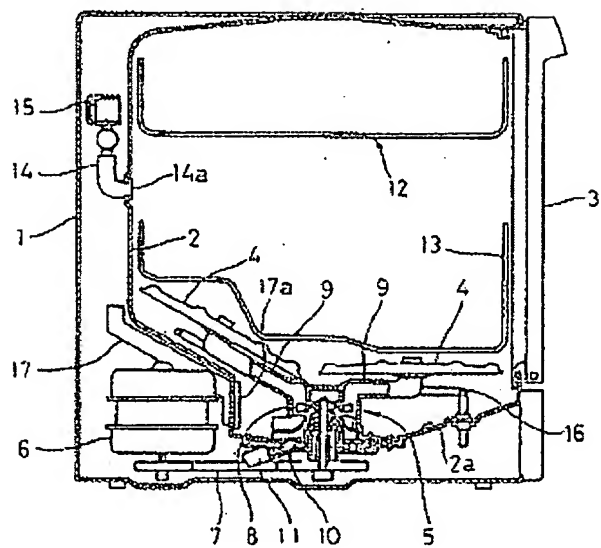


Figure 3:



第 3 図

Figure 4:



第 4 図